

WHAT IS CLAIMED IS:

1. A luminescent device:

comprising an organic luminescent element comprising:

an anode;

a cathode; and

a hole transporting layer provided between the anode and the cathode,
comprising a first compound and a second compound;

wherein the first compound is smaller in ionization potential than the second

compound, and

wherein the second compound is larger in hole mobility than the first compound.

2. A luminescent device according to claim 1, wherein there is a concentration
gradient that a concentration of the first compound is decreased toward the cathode from
the anode and a concentration of the second compound is increased toward the cathode
from the anode.

3. A luminescent device according to claim 1, wherein the first compound
comprises a phthalocyanine compound.

4. A luminescent device according to claim 1, wherein the second compound
comprises an aromatic amine-based compound.

5. A luminescent device according to claim 1, wherein the organic luminescent
element has a luminescence from a triplet excited state.

6. A luminescent device according to claim 1, wherein the luminescent device is
an electric appliance selected from the group consisting of a display device, a video
camera, a digital camera, an image reproducing device, a mobile portable computer, a
personal computer, a cellular phone, and an audio.

7. A luminescent device:

comprising an organic luminescent element comprising:

an anode;

a cathode; and

an electron transporting layer provided between the anode and the cathode, comprising a first compound and a second compound;

wherein the first compound is larger in electron affinity than the second
5 compound, and

wherein the second compound is larger in electron mobility than the first compound.

8. A luminescent device according to claim 7, wherein there is a concentration
10 gradient that a concentration of the first compound is increased toward the cathode from the anode and a concentration of the second compound is decreased toward the cathode from the anode.

9. A luminescent device according to claim 7, wherein the first compound is
15 selected from the group consisting of alkali metal halogenide, a metal complex having a quinoline skeleton, a metal complex having a benzoquinoline skeleton, an oxadiazole derivative, or a triazole derivative.

10. A luminescent device according to claim 7, wherein the second compound is
20 selected from the group consisting of a metal complex having a quinoline skeleton, a metal complex having a benzoquinoline skeleton, an oxadiazole derivative, a triazole derivative, or a phenanthroline derivative.

11. A luminescent device according to claim 7, wherein the organic luminescent
25 element has a luminescence from a triplet excited state.

12. A luminescent device according to claim 7, wherein the luminescent device
is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a
30 personal computer, a cellular phone, and an audio.

13. A luminescent device:

comprising an organic luminescent element comprising:

an anode;

comprising a first compound, a second compound, and a third compound;

wherein the first compound is larger in hole mobility than the second compound,

wherein the second compound is larger in electron mobility than the first compound, and

wherein an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit in the third compound is smaller than energy differences between a highest occupied molecular orbit and a lowest unoccupied molecular orbit in the first compound and the second compound.

20. A luminescent device according to claim 19, wherein there is a concentration gradient that a concentration of the first compound is decreased toward the cathode from the anode and a concentration of the second compound is increased toward the cathode from the anode.

21. A luminescent device according to claim 19, wherein the first compound comprises an aromatic amine-based compound.

22. A luminescent device according to claim 19, wherein the second compound is selected from the group consisting of a metal complex having a quinoline skeleton, a metal complex having a benzoquinoline skeleton, an oxadiazole derivative, a triazole derivative, or a phenanthroline derivative.

23. A luminescent device according to claim 19, wherein the organic luminescent element has a luminescence from a triplet excited state.

24. A luminescent device according to claim 19, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

25. A luminescent device comprising:
an organic luminescent element comprising:
an anode;
a cathode;

a luminescent layer provided between the anode and the cathode; and
a blocking layer adjacent to the luminescent layer, being provided
between the anode and the cathode;

wherein the blocking layer comprises a blocking material and a material
5 contained in the luminescent layer, and

wherein an energy difference between a highest occupied molecular orbit and a
lowest unoccupied molecular orbit in the blocking material is larger than an energy
difference between a highest occupied molecular orbit and a lowest unoccupied
molecular orbit in a material contained in the luminescent layer.

26. A luminescent device according to claim 25, wherein there is a concentration
gradient that a concentration of the material contained in the luminescent layer is
decreased toward the cathode from the anode and a concentration of the blocking
material is increased toward the cathode from the anode.

27. A luminescent device according to claim 25, wherein the blocking material
is selected from the group consisting of an oxadiazole derivative, a triazole derivative, or
a phenanthroline derivative.

28. A luminescent device according to claim 25 wherein the organic luminescent
element presents luminance caused from a triplet excited state.

29. A luminescent device according to claim 25, wherein the luminescent device
is an electric appliance selected from the group consisting of a display device, a video
camera, a digital camera, an image reproducing device, a mobile portable computer, a
personal computer, a cellular phone, and an audio.

30. A luminescent device comprising:
an organic luminescent element comprising:

an anode;

a cathode; and

an organic compound layer provided between the anode and the cathode,
comprising a hole transporting region comprising a hole transporting material and an
electron transporting region comprising an electron transporting material;

wherein the hole transporting region being disposed nearer to the anode than the electron transporting region, and

wherein a mixed region comprising the hole transporting material and the electron transporting material is provided between the hole transporting region and the
5 electron transporting region.

31. A luminescent device according to claims 30, wherein there is a concentration gradient in the mixed region that a concentration of the hole transporting material is decreased toward the cathode from the anode and a concentration of the
10 electron transporting material is increased toward the cathode from the anode.

32. A luminescent device according to claim 30, wherein a luminescent material is doped in the mixed region.

33. A luminescent device according to claim 30, wherein a luminescent material is doped in a portion in the mixed region.
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34. A luminescent device according to claim 30, wherein a blocking material is doped in the mixed region and an energy difference between a highest occupied
20 molecular orbit and a lowest unoccupied molecular orbit in the blocking material is larger than energy differences in the hole transporting material and in the electron transporting material.

35. A luminescent device according to claim 34, wherein the blocking material
25 is doped in a portion of the mixed region.

36. A luminescent device according to claim 34, wherein a luminescent material and the blocking material are doped in the mixed region.

37. A luminescent device according to claim 36, wherein a portion added the luminescent material is disposed nearer to the anode than a portion added the blocking material.
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38. A luminescent device according to one of claim 32 to 34 or one of claim 36

to 37, wherein the luminescent material presents luminance caused from a triplet excited state.

39. A luminescent device according to claim 36, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.

40. A luminescent device according to claim 36, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

41. A luminescent device according to claim 25, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

42. A luminescent device:

comprising an organic luminescent element comprising:

an anode;

a cathode;

a hole injecting region adjacent to the anode; and

an organic compound layer provided between the hole injecting region and the cathode, comprising a hole transporting region comprising a hole transporting material and an electron transporting region comprising an electron transporting material;

wherein the hole transporting region being disposed nearer to the anode than the

electron transporting region, and

wherein a mixed region comprising the hole transporting material and the electron transporting material is provided between the hole transporting region and the electron transporting region.

43. A luminescent device according to claims 42, wherein there is a concentration gradient in the mixed region that a concentration of the hole transporting material is decreased toward the cathode from the anode and a concentration of the electron transporting material is increased toward the cathode from the anode.

44. A luminescent device according to claim 42, wherein a luminescent material is doped in the mixed region.

45. A luminescent device according to claim 42, wherein a luminescent material
5 is doped in a portion in the mixed region.

46. A luminescent device according to claim 42, wherein a blocking material is doped in the mixed region and an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit in the blocking material is
10 larger than energy differences in the hole transporting material and in the electron transporting material.

47. A luminescent device according to claim 46, wherein the blocking material is doped in a portion of the mixed region.
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48. A luminescent device according to claim 46, wherein a luminescent material and the blocking material are doped in the mixed region.

49. A luminescent device according to claim 48, wherein a portion added the
20 luminescent material is disposed nearer to the anode than a portion added the blocking material.

50. A luminescent device according to one of claim 44 to 45 or one of claim 48 to 49, wherein the luminescent material presents luminance caused from a triplet excited
25 state.

51. A luminescent device according to claim 48, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.
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52. A luminescent device according to claim 48, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

53. A luminescent device according to claim 42, wherein the luminescent device

is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

- 5 54. A luminescent device comprising:
 an organic luminescent element comprising:
 an anode;
 a cathode;
 an electron injecting region contacted with the cathode; and
10 an organic compound layer provided between the anode and the
 electron injecting region, comprising a hole transporting region comprising a hole
 transporting material and an electron transporting region comprising an electron
 transporting material;
 wherein the hole transporting region being disposed nearer to the anode than the
15 electron transporting region, and
 wherein a mixed region comprising the hole transporting material and the
 electron transporting material is provided between the hole transporting region and the
 electron transporting region.
- 20 55. A luminescent device according to claims 54, wherein there is a
 concentration gradient in the mixed region that a concentration of the hole transporting
 material is decreased toward the cathode from the anode and a concentration of the
 electron transporting material is increased toward the cathode from the anode.
- 25 56. A luminescent device according to claim 54, wherein a luminescent material
 is doped in the mixed region.
57. A luminescent device according to claim 54, wherein a luminescent material
 is doped in a portion in the mixed region.
- 30 58. A luminescent device according to claim 54, wherein a blocking material is
 doped in the mixed region and an energy difference between a highest occupied
 molecular orbit and a lowest unoccupied molecular orbit in the blocking material is
 larger than energy differences in the hole transporting material and in the electron

transporting material.

59. A luminescent device according to claim 58, wherein the blocking material is doped in a portion of the mixed region.

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60. A luminescent device according to claim 58, wherein a luminescent material and the blocking material are doped in the mixed region.

61. A luminescent device according to claim 60, wherein a portion added the luminescent material is disposed nearer to the anode than a portion added the blocking material.

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62. A luminescent device according to one of claim 56 to 57 or one of claim 60 to 61, wherein the luminescent material presents luminance caused from a triplet excited state.

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63. A luminescent device according to claim 60, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.

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64. A luminescent device according to claim 60, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

65. A luminescent device according to claim 54, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

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66. A luminescent device comprising:
an organic luminescent element comprising:

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an anode;

a cathode;

a hole injecting region adjacent to the anode;

an electron injecting region adjacent to the cathode; and

an organic compound layer provided between the hole injecting region and the electron injecting region, comprising a hole transporting region comprising a hole transporting material and an electron transporting region comprising an electron transporting material;

5 wherein the hole transporting region is disposed nearer to the anode than the electron transporting region, and

wherein a mixed region comprising the hole transporting material and the electron transporting material is provided between the hole transporting region and the electron transporting region.

10 67. A luminescent device according to claims 66, wherein there is a concentration gradient in the mixed region that a concentration of the hole transporting material is decreased toward the cathode from the anode and a concentration of the electron transporting material is increased toward the cathode from the anode.

15 68. A luminescent device according to claim 66, wherein a luminescent material is doped in the mixed region.

20 69. A luminescent device according to claim 66, wherein a luminescent material is doped in a portion in the mixed region.

70. A luminescent device according to claim 66, wherein a blocking material is doped in the mixed region and an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit in the blocking material is
25 larger than energy differences in the hole transporting material and in the electron transporting material.

71. A luminescent device according to claim 70, wherein the blocking material is doped in a portion of the mixed region.

30 72. A luminescent device according to claim 70, wherein a luminescent material and the blocking material are doped in the mixed region.

73. A luminescent device according to claim 72, wherein a portion added the

luminescent material is disposed nearer to the anode than a portion added the blocking material.

74. A luminescent device according to one of claim 69 to 70 or one of claim 72 to 73, wherein the luminescent material presents luminance caused from a triplet excited state.

75. A luminescent device according to claim 72, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.

76. A luminescent device according to claim 72, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

77. A luminescent device according to claim 66, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

78. A luminescent device comprising:
an organic luminescent element comprising:
an anode;
a cathode; and
an organic compound layer provided between the anode and the cathode,
comprising a hole transporting region comprising a hole transporting material and an electron transporting region comprising an electron transporting material;
wherein a mixed region is provided between the hole transporting region and the electron transporting region, comprising the hole transporting material and the electron transporting material,
wherein a luminescent region added a luminescent material is provided in the mixed region.

79. A luminescent device according to claim 78, wherein the mixed region comprises the hole transporting material and the electron transporting material at a

constant ratio.

80. A luminescent device according to claim 78, wherein the luminescent region is a part of the mixed region.

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81. A luminescent device according to claim 78, wherein a blocking material is doped in a portion of the mixed region, in which an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit is large as compared with energy differences in the hole transporting material and the electron transporting material.

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82. A luminescent device according to claim 81, wherein the luminescent region is disposed nearer to the anode than the portion added the blocking material.

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83. A luminescent device according to claim 78, wherein the luminescent material presents luminance caused from a triplet excited state.

84. A luminescent device according to claim 78, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.

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85. A luminescent device according to claim 78, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

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86. A luminescent device according to claim 78, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

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87. A luminescent device comprising:
an organic luminescent element comprising:
an anode;
a cathode;
a hole injecting region adjacent to the anode; and

an organic compound layer provided between the hole injecting region and the cathode, comprising a hole transporting region comprising a hole transporting material and an electron transporting region comprising an electron transporting material;

wherein a mixed region is provided between the hole transporting region and the electron transporting region, comprising the hole transporting material and the electron transporting material, and

wherein a luminescent region added a luminescent material is provided in the mixed region.

88. A luminescent device according to claim 87, wherein the mixed region comprises the hole transporting material and the electron transporting material at a constant ratio.

89. A luminescent device according to claim 87, wherein the luminescent region is a part of the mixed region.

90. A luminescent device according to claim 87, wherein a blocking material is doped in a portion of the mixed region, in which an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit is large as compared with energy differences in the hole transporting material and the electron transporting material.

91. A luminescent device according to claim 90, wherein the luminescent region is disposed nearer to the anode than the portion added the blocking material.

92. A luminescent device according to claim 87, wherein the luminescent material presents luminance caused from a triplet excited state.

93. A luminescent device according to claim 87, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.

94. A luminescent device according to claim 87, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

95. A luminescent device according to claim 87, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

96. A luminescent device comprising:
an organic luminescent element comprising:

an anode;

a cathode;

an electron injecting region adjacent to the cathode; and

an organic compound layer provided between the electron injecting region and the cathode, comprising a hole transporting region comprising a hole transporting material and an electron transporting region comprising an electron transporting material;

wherein a mixed region is provided between the hole transporting region and the electron transporting region, comprising the hole transporting material and the electron transporting material, and

wherein a luminescent region added a luminescent material is provided in the mixed region.

97. A luminescent device according to claim 96, wherein the mixed region comprises the hole transporting material and the electron transporting material at a constant ratio.

98. A luminescent device according to claim 96, wherein the luminescent region is a part of the mixed region.

99. A luminescent device according to claim 96, wherein a blocking material is doped in a portion of the mixed region, in which an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit is large as compared with energy differences in the hole transporting material and the electron transporting material.

100. A luminescent device according to claim 99, wherein the luminescent region is disposed nearer to the anode than the portion added the blocking material.

101. A luminescent device according to claim 96, wherein the luminescent
5 material presents luminance caused from a triplet excited state.

102. A luminescent device according to claim 96, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.

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103. A luminescent device according to claim 96, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

104. A luminescent device according to claim 96, wherein the luminescent
15 device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

105. A luminescent device comprising:
20 an organic luminescent element comprising:

an anode;

a cathode;

a hole injecting region adjacent to the anode;

an electron injecting region adjacent to the cathode; and

25 an organic compound layer provided between the electron injecting region and the hole injecting region, comprising a hole transporting region comprising a hole transporting material and an electron transporting region comprising an electron transporting material;

30 wherein a mixed region is provided between the hole transporting region and the electron transporting region, comprising the hole transporting material and the electron transporting material, and

wherein a luminescent region added a luminescent material is provided in the mixed region.

106. A luminescent device according to claim 105, wherein the mixed region comprises the hole transporting material and the electron transporting material at a constant ratio.

107. A luminescent device according to claim 105, wherein the luminescent region is a part of the mixed region.

108. A luminescent device according to claim 105, wherein a blocking material is doped in a portion of the mixed region, in which an energy difference between a highest occupied molecular orbit and a lowest unoccupied molecular orbit is large as compared with energy differences in the hole transporting material and the electron transporting material.

109. A luminescent device according to claim 108, wherein the luminescent region is disposed nearer to the anode than the portion added the blocking material.

110. A luminescent device according to claim 105, wherein the luminescent material presents luminance caused from a triplet excited state.

111. A luminescent device according to claim 105, wherein the ratio of a mass of the hole transporting material to the total mass of the hole transporting material and the electron transporting material in the mixed region is 10 % or more and 90 % or less.

112. A luminescent device according to claim 105, wherein the mixed region has a thickness of 10 nm or more and 100 nm or less.

113. A luminescent device according to claim 105, wherein the luminescent device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

114. A luminescent device comprising:
an organic luminescent element comprising:
an anode;

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a cathode;

a first mixed region adjacent to the anode, comprising a hole injecting material and a hole transporting material;

a second mixed region adjacent to the cathode, comprising an electron injecting material and an electron transporting material; and

a third mixed region provided between the first mixed region and the second mixed region, comprising the hole transporting material and the electron transporting material.

115. A luminescent device according to claim 114, wherein there is a concentration gradient in the first mixed region that a concentration of the hole transporting material is decreased toward the third region from the anode and a concentration of the hole injecting material is increased toward the third region from the anode.

116. A luminescent device according to claim 114, wherein there is a concentration gradient in the second region that a concentration of the electron transporting material is increased toward the third region from the cathode and a concentration of the electron injecting material is decreased toward the third region from the cathode.

117. A luminescent device according to claim 114, wherein there is a concentration gradient in the third region that a concentration of the electron transporting material is decreased toward the first region from the second region and a concentration of the hole transporting material is increased toward the first region from the second region.

118. A luminescent device according to claim 114, wherein a luminescent material is doped in a portion of the third region.

119. A luminescent device according to claim 118, wherein the luminescent material is a triplet luminescent diode.

120. A luminescent device according to claim 118, wherein the luminescent

device is an electric appliance selected from the group consisting of a display device, a video camera, a digital camera, an image reproducing device, a mobile portable computer, a personal computer, a cellular phone, and an audio.

- 5 121. A luminescent device comprising:
 an organic luminescent element comprising:
 an anode;
 a cathode;
 a first mixed region contiguous to the anode, comprising a hole
10 injecting material and a hole transporting material;
 a second mixed region contiguous to the first region, comprising the
hole transporting material and a host material;
 a third mixed region contiguous to the second mixed region, comprising
the host material and a blocking material; and
15 a fourth mixed region provided between the third mixed region and the
cathode, comprising the blocking material and an electron injecting material.

122. A luminescent device according to claim 121, wherein there is a
concentration gradient in the first region that a concentration of the hole injecting
20 material is decreased toward the second region from the anode and a concentration of the
hole transporting material is increased toward the second region from the anode.

123. A luminescent device according to claim 121, wherein there is a
concentration gradient in the second region that a concentration of the hole transporting
25 material is decreased toward the third region from the first region and a concentration of
the host material is increased toward the third region from the first region.

124. A luminescent device according to claim 121, wherein there is a
concentration gradient in the third region that a concentration of the host material is
30 decreased toward the fourth region from the second region and a concentration of the
blocking material is increased toward the fourth region from the second region.

125. A luminescent device according to claim 121, wherein there is a
concentration gradient in the fourth region that a concentration of the blocking material is

decreased toward the cathode from the third region and a concentration of the electron injecting material is increased toward the cathode from the third region.

126. A luminescent device according to claim 121, wherein a luminescent
5 material is doped in a portion of both second region and third region.

127. A luminescent device according to claim 126, wherein the luminescent material is a triplet luminescent diode.

10 128. A luminescent device according to claim 121, wherein the blocking material is an electron transporting material.